AYK Region
Norton Sound/Kotzebue
Salmon Escapement Report #34

Squirrel River
Counting Tower Project, 1984

March 1985

Joseph Dinnocenzo
Alaska Department of Fish and Game
Division of Commercial Fisheries
Kotzebue, Alaska

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

INTRODUCTION

Located approximately 30 miles above the arctic circle, Kotzebue Sound supports the northern most commercial salmon fishery in Alaska (Figure 1). Although the numerous drainages in the region support five species of pacific salmon (Oncorhynchus sp.) chum salmon (O. keta), that spawn in the Noatak and Kobuk Rivers, are the most abundant. Historic escapement data (based on aerial surveys) indicate that the Kobuk River supports a chum salmon population roughly one fourth that of the Noatak River yet sustains a much larger subsistence harvest (A.D.F.G., 1983). Subsistence harvest on the Noatak River is largely confined to the vicinity of Noatak Village, whereas residents of five Kobuk River villages (Noorvik, Kiana, Ambler, Shungnak and Kobuk) intercept chum salmon for subsistence purposes (Figure 1).

Run timing differences, identified in two separate mark and recapture experiments (Yanagawa, 1968; Dinnocenzo, 1981; Bigler and Burwen, 1984), provide the foundation for management strategy of the two major contributing chum salmon stocks in the Kotzebue Sound commercial fishery. In the commercial fishing district, Kobuk River chum salmon abundance peaks in late July (approximately July 31). Noatak River chum salmon peak approximately one week later than Kobuk River fish, or the first week of August. A slight tendency for Kobuk River chum salmon to migrate along the Baldwin Peninsula was also noted but spatial tendencies are not relied upon for management decisions.

Current management strategy attempts to afford more protection to Kobuk River stocks by limiting fishing time to two 24 hour fishing periods per week during the month of July. Depending upon comparative commercial catch and effort statistics and escapement information, fishing time is increased during August to allow exploitation of the larger Noatak River stock.

Since the modern inception of the Kotzebue commercial fishery in 1962, escapement assessments of the Noatak and Kobuk Rivers have been confined to aerial surveys. (Hydroacoustic enumeration has been researched on the Noatak River (Mesiar, 1985) but published escapement estimations are aerial survey results.) Aerial survey techniques allow frequent and relatively inexpensive observations of escapement magnitude. Estimates derived through aerial surveys are interpreted as an index of escapement due to the influence of water and weather conditions, as well as observer

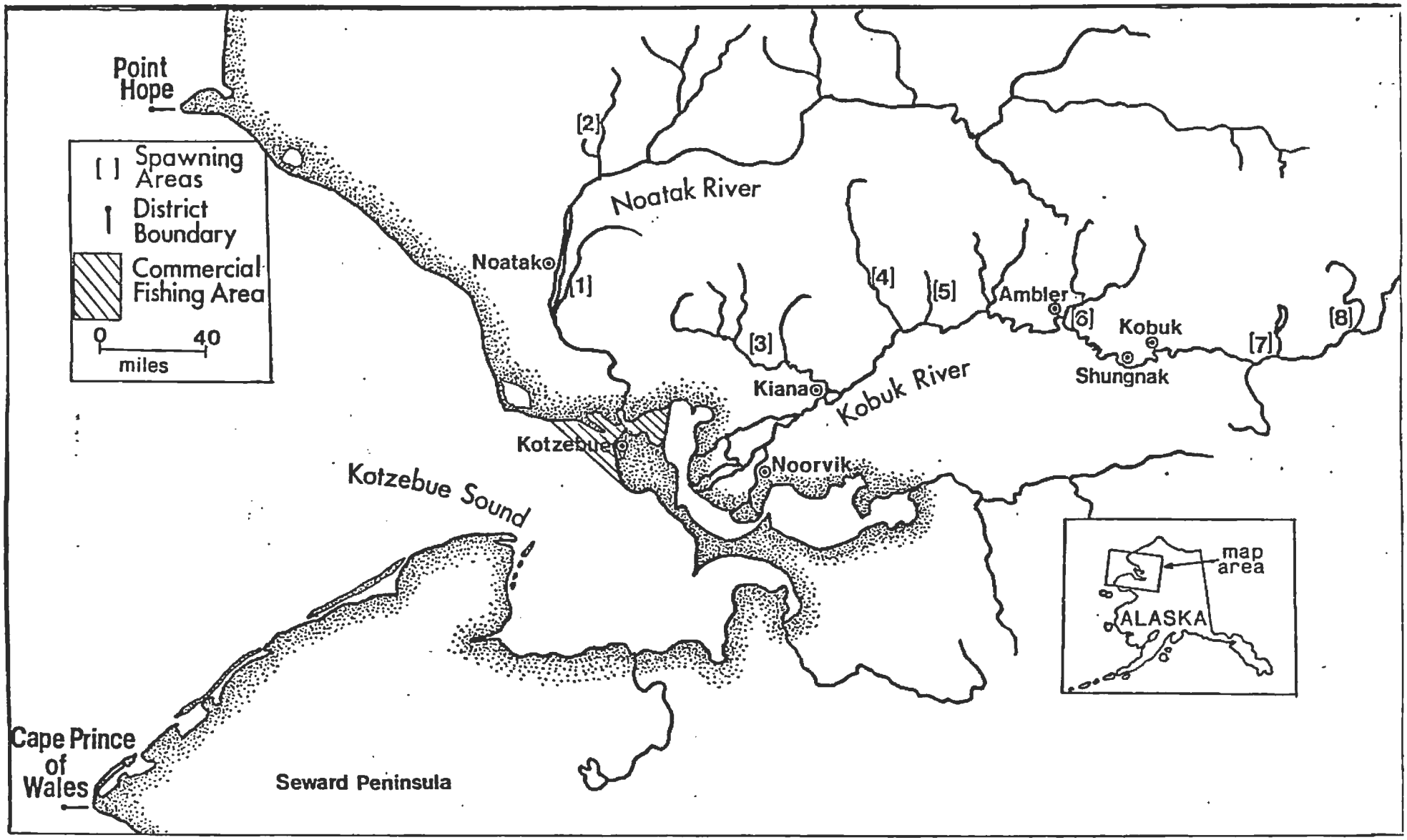

Figure 1. Kotzebue Sound commercial salmon fishing district and major chum salmon spawning areas in the Noatak and Kobuk River drainages. (1) Noatak River (lower 100 miles), (2) Kelly River and Creek, (3) Squirrel River, (4) Salmon River, (5) Tutuksuk River, (6) Ambler River, (7) Selby River and Slough, (8) Beaver Creek.

accuracy, on overall survey effectiveness.

The Squirrel River, originating in the Baird Mountains and flowing southeast to meet the Kobuk River, is the most significant chum salmon producing tributary of the Kobuk River drainage (Figure 2). In 1982 (Dinnocenzo, 1982), and again in 1984, the Department operated a salmon counting tower on the Squirrel River, approximately 45 miles from the Kobuk River confluence. Estimates of escapement derived from counting tower operations are considered more precise than that of aerial surveys, and can provide management personnel with escapement information on a daily basis. The objectives of the Squirrel River Counting Tower Project in 1984 were to:

1) Determine daily and seasonal escapement magnitude of salmon.
2) Determine run timing of salmon.
3) Document the age, sex and size composition of chum salmon escapement.

METHODS AND MATERIALS

Cite Construction and Operation

The site used for counting in 1982 was again used in 1984. This site has several qualities that proved adequate to tower counting:

1) A 60 foot bluff is located on the south side of the river at this point, which provided an excellent viewing angle when the 24 foot tower scaffolding was erected at the top.
2) The river is approximately 220 feet wide and seven to eight feet deep.
3) There are no irregularities in the water flow.

In general, the favorable qualities of the cite chosen allowed accurate counting even in marginal light and water conditions.

Three white canvas (flash) panels, to improve visibility, were installed across the river using 3/8 inch cable. Cables were anchored to shore using "duck bill" anchors and at midriver using four-40 pound Danforth anchors. Problems with flash panels rising off the bottom in heavy current encountered in 1982 were eliminated by the use of three separate panels. Furthermore, three panels proved easier to install and retrieve.

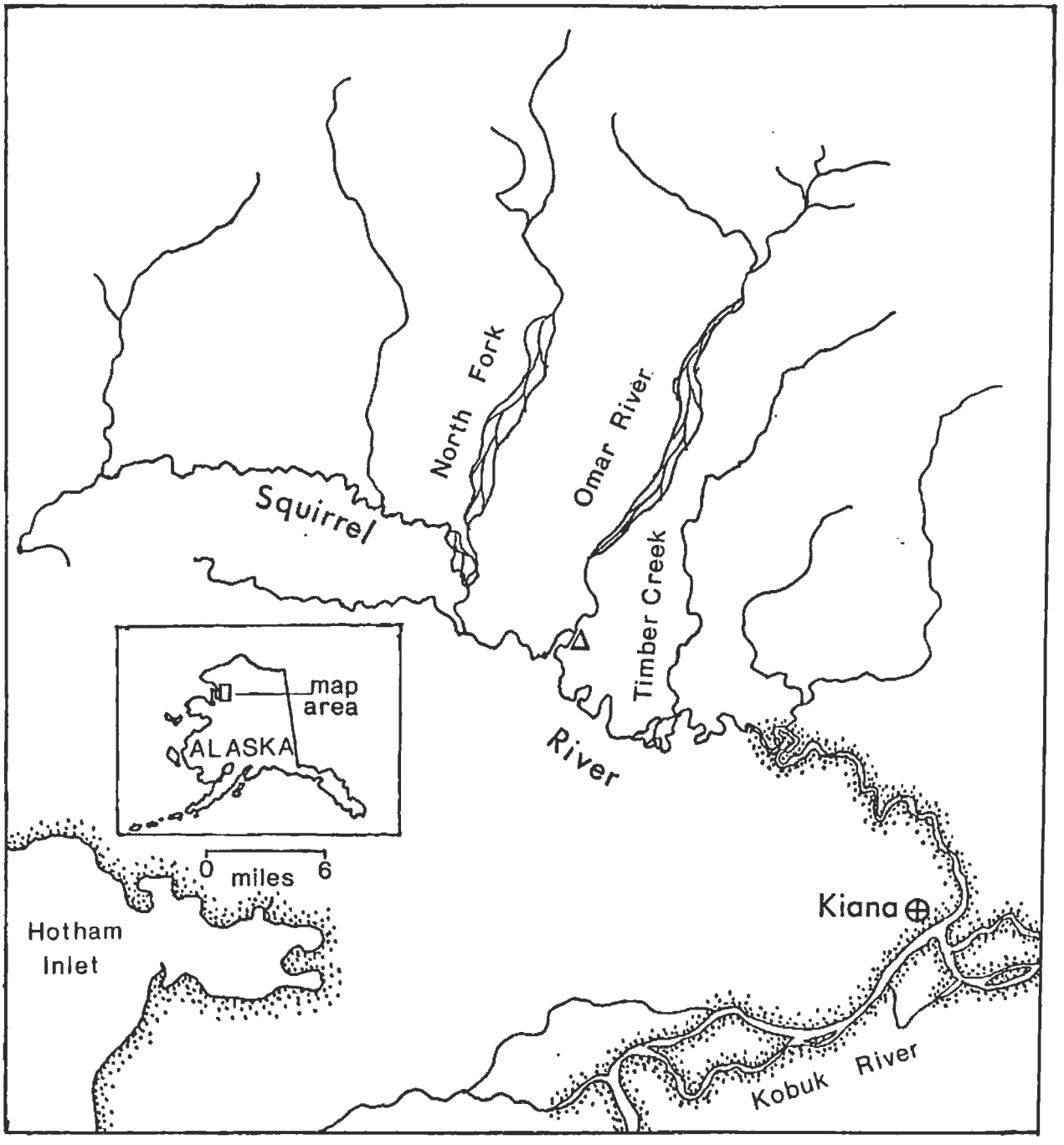

Figure 2. Squirrel River drainage and site of the Squirrel River counting tower project (Δ), 1982 and 1984.

A weir, constructed of light-duty wire fencing and posts, extended from each shoreline to direct fish over the flash panels. These proved suitable under normal conditions but required periodic maintenance during and after high water.

A lighting system, using 100 watt lights and suspended above the flash panel on a 1/4 inch cable, was available but not used due to premature project termination.

Tent frames used in 1982 were repaired and utilized in 1984. A single side band radio was installed and used to transmit field data to Kotzebue on a daily basis.

Following transportation and installation of all equipment, counting commenced on July 11. Counting was performed daily from 0000 until 0800, and from 1400 through 2400. Results from operations in 1982 demonstrate that peak fish passage occurs during this time. Had the project operated on the anticipated schedule, sample periods would have been altered (0000-1000 and 1600-2400) to reflect the change in time zone imposed during the winter of 1983-84 which had not been considered during pre-season planning.

Thirty minutes of each operating hour an observer counted salmon, by species, passing the tower either up- or downstream. The net upstream count was doubled to estimate the 30 minute period not counted. Following each counting period, data and counting conditions were recorded. The evaluation of counting conditions was reported as one of five codes:

(4) Excellent visibility. Fish visible anywhere on panel or gravel.
(3) Good visibility. Fish visible on panel but gravel obscured. Conditions influenced by wind, rain, turbidity, darkness, etc.
(2) Good-poor visibility. Sections of panel and gravel obscured, possible adverse effect on counts.
(1) Poor visibility. Minimal visibility, minimum count possible.
(0) Extremely poor visibility. Unable to count.

No counts were attempted during conditions rated "0", water conditions were monitored, however, on an hourly basis.

Chum Salmon Age, Sex and Size
A beach seine (120 feet long, 6 feet deep) was operated at a site approximately two miles downstream from camp (Figure 2) using the 16 foot river boat, powered by a 35 horsepower outboard motor with a jet unit. All chum salmon captured were measured for length (mideye-fork), examined for sex, and three scales removed (from the preferred scale area) for age determination. Carcasses were to be sampled similarly.

Weather Conditions
Air and water temperature, percent cloud cover, precipitation, relative water depth and color were recorded daily. Relative water depth was measured from a post driven into the river at the time camp was established. Measurements taken when this post was submerged were expressed as the distance from the top of the bank to water surface.

Logistical And Other Support
Supplies necessary for camp operations were delivered periodically by chartered aircraft from Kotzebue. At seasons end, the tent frames were left in place, the counting tower was stored at the site and the river boat was left in Kiana on Ruth Sandvik's property (near the oil tanks). All remaining equipment was brought to Kotzebue for storage.

RESULTS AND DISCUSSION

Escapement Enumeration
The first chum salmon passed the tower site on July 24, thirteen days later than the first of 1982. Counting conditions prior to July 24 were rated "excellent", limiting the possibility of unobserved fish movement.

The remainder of the 1984 season was characterized by heavy rainfall and flooding conditions which precluded reasonable counting except for brief periods. Peak salmon movement occurred on July 29 when an expanded count of 774 chum, 902 pink, and 2 chinook salmon, was documented (Table 1). Following July 28, water and weather conditions were so consistently poor that meaningful counts were rare and of no practical use (Table 2). The project was terminated prematurely on August 8 due to extended heavy rain and high water conditions.

Table 1. Net upstream daily counts of salmon, Squirrel River counting tower project, 1984.

Date	Hours Counted(1)	Net Upstream Daily Expanded Counts			Cumulative Totals		
		Chum	Pink	Chinook	Chum	Pink	Chinook
July							
11	2000-2100	0	0	0	0	0	0
12	1800-0800	0	0	0	0	0	0
13	1800-0800	0	0	0	0	0	0
14	1800-0800	0	0	0	0	0	0
15	1800-0800	0	0	0	0	0	0
16	1800-0800	0	0	0	0	0	0
17	1800-0800	0	0	0	0	0	0
18	1800-0800	0	0	0	0	0	0
19	1800-0800	0	0	0	0	0	0
20	1800-0800	0	0	0	0	0	0
21	1800-0800	0	0	0	0	0	0
22	1800-0800	0	0	0	0	0	0
23	1800-0800	0	0	0	0	0	0
24	1800-0800	40	0	0	40	0	0
25	1800-0800	16	0	0	56	0	0
26	1800-0800	74	4	0	130	4	0
27	1800-0800	114	322	2	244	326	2
28	1800-0800	100	300	0	344	626	2
29	0000-0800	430	376	0	774	1,002	2
30	1600-2400	54	32	0	828	1,034	2
31	0000-0100 0600-0900	36	0	0	864	1,034	2
August							
1	(2)						
2	(2)						
3	(2)						
4	(2)						
5	(2)						
6	1300-2100	30	4	0	894	1,038	2
7	1100-2200	46	0	0	940	1,038	2
8	1400-2200	98	16	0	1,038	1,054	2

(1) Unless otherwise noted, counting occurred from 1800 through 2400, and from 0000 through 0800.
(2) Counts not possible due to high water.

Table 2. Weather observations, Squirrel River salmon counting tower project, 1984.

Date	Sky(1) AM	Sky(1) PM	Precip(2) AM	Precip(2) PM	Time of Observation	Air Temp	Water Temp	Water Gauge(3)	Water Color(4)
July									
8	4	4	A	A	1700		7		5
9	4	4	A	A	1700		7	0	2
10	2	3	A	A	1800		10	6	2
11	1	1	-	-	1800		12	9.5	1
12	1	1	-	-	1830		13	14	1
13	1	1	-	-	1800		14	17	1
14	1	1	-	-	1800		14	20	1
15	1	1	-	-	1715	24	15	21.5	1
16	3	1	-	-	1715	26	15	23	1
17	4	4	A	A	1730	17	13	24.5	2
18	4	4	A	A	1705	12	11	25	2
19	2	2	-	-	1830	16	12	17.5	2
20	3	3	A	A	1900	14	10	20.5	1
21	2	1	-	-	1900	13	11	22.5	1
22	1	2	-	-	1830	17	12	24.5	1
23	3	3	-	-	1915	20	13	26	1
24	4	4	A	A	1745	16	12	24.5	1
25	4	2	A	A	1850	17	12	15	1
26	3	3	-	-	1900	17	12	14	1
27	2	3	-	-	1810	19	12	18.5	2
28	4	4	B	A	1810	10	10	19.5	2
29	4	4	-	-	2000	8	10	(5)	5
30	4	4	A	B	2030	10	9	2	3
31	4	3	B	A	1830	8	8	(5)	5
August									
1	4	4	A	B	1900	9	8	(5)	5
2	5	4	A	A	1930	11	8	(5)	5
3	4	4	A	A	1840	11	8	(5)	5
4	4	4	-	-	1930	12	9	16	5
5	2	2	-	-	1930	14	10	8	4
6	1	1	-	-	1830	17	11	4	3
7	3	4	-	A	1850	10	8	-	3
8	4	4	A	A	1830	10	9	6	3

(1) Sky: 0-No Observation Made
1-Clear Sky, cloud covering not more than 1/10 of sky
2-Cloud covering not more than 1/2 of sky
3-Cloud covering more than 1/2 of sky
4-Completely overcast
5-Fog or thick haze

(2) Precipitation: A-Intermittent Rain; B-Continuous rain.

(3) Relative water height, in inches.

(4) Water Color: 1-Clear; 2-Light brown; 3-Brown; 4-Dark brown; 5-Murky or glacial.

(5) Water gauge completely submerged, flooding conditions.

Few meaningful conclusions can be drawn from data collected in 1984. Comparisons with data collected in 1982 would have provided valuable knowledge of run timing and escapement. What little information that was collected suggested that the 1984 chum salmon escapement started later than in 1982.

Chum Salmon Age, Sex and Size

High water conditions that prevailed through the 1984 season did not allow use of the beach seine until August 6. Once seining efforts began, few sites were located with qualities needed for efficient seining activity. A total of 30 chum salmon was captured between August 6 and 8. This sample size is not sufficient to allow practical analysis (Table 3).

Table 3. Chum salmon age, sex and size data, Squirrel River tower project, 1984.

Date of Collection	Sex	Size(mm)	Age (1)
9/6	Female	596	Ø.3
9/6	Female	57Ø	Ø.3
9/6	Male	63Ø	Ø.3
9/6	Male	635	Ø.3
9/6	Male	583	Ø.3
9/6	Male	6Ø8	Ø.3
9/6	Male	645	Ø.3
9/6	Female	558	Ø.3
9/6	Male	63Ø	Ø.3
9/6	Female	57Ø	Ø.3
9/6	Female	595	Ø.4
9/6	Female	534	Ø.2
9/6	Male	547	-
9/7	Male	634	-
9/7	Male	543	Ø.3
9/8	Male	645	Ø.4
9/8	Female	543	Ø.2
9/8	Female	566	Ø.3
9/8	Female	542	-
9/8	Female	632	Ø.3
9/8	Male	597	Ø.3
9/8	Male	595	Ø.3
9/8	Female	63Ø	-
9/8	Female	523	Ø.2
9/8	Female	534	Ø.2
9/8	Male	638	Ø.3
9/8	Male	6Ø2	Ø.3
9/8	Female	572	Ø.3
9/8	Female	6Ø8	Ø.4

(1) European age designation: the first digit represents freshwater age, the second digit represents ocean age. Samples not aged are designated "-".

ACKNOWLEDGMENTS

The author would like to express gratitude to Brian Bigler for editorial comments and criticisms which greatly improved the final report.

LITERATURE CITED

A.D.F.G. 1983. Annual Management Report, 1983. Norton Sound-Port Clarence-Kotzebue Sound, 1983. 165pp.

Bigler, B. and D. Burwen. 1984. Migratory timing and spatial entry patterns of chum salmon (Oncorhynchus keta) in Kotzebue Sound. Alaska Department of Fish and Game Informational Leaflet No. 238. 23 pp.

Dinnocenzo, J. 1981. Kotzebue Sound chum salmon tagging project. AYK Region Norton Sound/Kotzebue Stock Separation Report #2. 50pp.

Dinnocenzo, J. 1982. Squirrel River counting tower project, 1982. AYK Region Norton Sound/Kotzebue Escapement Report #28. 15pp.

Mesiar, D. 1985. Noatak River sonar studies, 1984. In prep.

Yanagawa, C. 1968. Kotzebue chum salmon tagging projects, 1966-1968. AYK Region Fishery Bulletin #7. 32pp.